

CHAPTER 5 WATER HEATERS

501 GENERAL

501.1 Scope

The provisions of this chapter shall govern the materials, design, and installation of water heaters.



501.3 Working Pressure Identification

All storage tanks and water heaters shall be clearly and indelibly marked showing the allowable safe working pressure.

501.4 Water Heater As Space Heater

A water heater may be used as a part of a space heating system if the outlet water temperature of the water heater does not exceed 160°F (71°C) and the potability of the water is maintained throughout the system.

501.5 Sediment Drains

A suitable water valve or cock, through which sediment may be drawn off or the heater or tank emptied, shall be installed at the bottom of the heater or tank.

501.6 Water Heating Equipment

A shutoff valve shall be provided in the cold water branch line to each water storage tank or each water heater, on the same floor within 3 feet of the heater. Full port ball valve shut-offs on cold water branch lines to 2 inches or full port ball or resilient wedge-type shut-off valves for 2 1/2 inch lines and larger shall be used.

501.7 Location

501.7.1 Water heaters and storage tanks shall be so located and connected that they will be accessible for observation, maintenance, servicing and replacement.

501.7.2 Gas water heaters in residential garages shall be installed so that all burners and burner ignition devices are located not less than 18 inches above the floor.

501.7.3 Gas water heaters shall be located, or reasonably protected, so that they are not subject to physical damage by a moving vehicle.

501.7.4 Every attic or furred space in which water heaters and/or storage tanks are installed shall be readily accessible by an opening and passageway as large as the largest piece of equipment and in no case less than 22 x 36 inches (559 x 914 mm) continuous from the opening to the equipment and its controls. The opening to the passageway should be located not more than 20 ft (6096 mm) from the equipment measured along the center line of such passageway. Every passageway shall be unobstructed and shall have solid continuous flooring not less than 24 inches (610 mm) wide from the entrance opening to the equipment. On the control side and on other sides where

access is necessary for servicing of equipment, a level working platform extending a minimum 30 inches (762 mm) from the edge of the equipment with a 36 inch (914 mm) high clear working space shall be provided.

501.8 Marking

501.8.1 Water Heaters. All water heaters shall bear the following, or equal wording on a visible decal or label by the manufacturer:

There shall be installed at time of heater installation a combination temperature and pressure relief valve, selected and located in conformance with the requirements of ANSI Z21.22.

501.8.2 Pressure Marking of Storage Tanks. Any storage tank installed for domestic hot water shall have clearly and indelibly stamped in the metal, or so marked upon a plate welded thereto or otherwise permanently attached, the maximum allowable working pressure. Such markings shall be in an accessible position outside of the tank so as to make inspection or reinspection readily possible. All unlisted storage tanks for domestic hot water shall meet the applicable ASME standards.

502 DEFINITIONS

The following definition has been moved to Chapter 2:
WATER HEATER.

503 STANDARDS

503.1 Electric Water Heaters

Electric residential water heaters shall comply with FS A-A-2956 and UL 174.

503.2 Gas Water Heaters

Automatic storage type gas water heaters with inputs of 75,000 Btuh (22 kW), or less shall comply with ANSI Z21.10.1. Circulating tank, instantaneous and large automatic storage type gas water heaters shall comply with ANSI Z21.10.3.

503.3 Testing and Listing

Water heaters shall be tested and listed by an approved agency.

504 MINIMUM CAPACITIES FOR RESIDENTIAL WATER HEATERS

Water heaters installed in residential occupancies may be sized in accordance with Table 504.

Table 504 Minimum Capacities For Water Heaters^{1,2,3}

Number of Bathrooms	1 to 1.5			2 to 2.5				3 to 3.5			
Number of Bedrooms	1	2	3	2	3	4	5	3	4	5	6
1st Hr Rating Gal.	42	54	54	54	67	67	80	67	80	80	80
Nom. Tank Size, Gal. Gas Water Heaters	20	30	30	30	40	40	50	40	50	50	50
Elect. Water Heaters	30	50	50	50	66	66	80	66	80	80	80
Oil Water Heaters	30	30	30	30	30	30	30	30	30	30	30

1 gal = 3.7854 L

Note:

1. The main criteria for a properly sized water heater is a sufficient first hour rating to meet peak hot water demand. The majority of tank sizes shown in the table will have a first hour rating equal to or greater than the first hour rating indicated. A water heater with a smaller tank size than shown in the table but with a sufficient first hour rating shall be permitted.
2. The first hour rating is found on the "Energy Guide" label.
3. Non-storage and solar water heaters shall be sized with sufficient capacity to meet the appropriate first hour rating shown in the table.

505 PROHIBITED INSTALLATIONS

505.1 Water heaters (using solid, liquid or gas fuel) with the exception of those having direct vent systems, shall not be installed in bathrooms and bedrooms or in a closet with access only through a bedroom or bathroom. However, water heaters of the automatic storage type may be installed as replacement in a bathroom, when specifically authorized by the plumbing official, provided they are properly vented and supplied with adequate combustion air.

Exception: When a closet, having a weather-stripped solid door with an approved door closing device, has been designed exclusively for the water heater and where all air for combustion and ventilation is supplied from outdoors.

505.2 Water heaters (using solid, liquid or gas fuel) shall not be installed in a room containing air handling machinery when such room is used as a plenum.

506 CONNECTIONS

506.1 The cold water branch line from the main water supply line to each hot water storage tank or water heater shall be provided with a valve accessible on the same floor, located near the equipment and only serving the hot water storage tank or water heater. The valving shall not interfere or cause a disruption of the cold water supply to the remainder of the cold water system.

506.2 The method of connecting a circulating water heater to the tank shall assure proper circulation of water through the heater, and permit a safe and useful temperature of water to be drawn from the tank. The pipe or tubes required for the installation of appliances which will draw from the water heater or storage tank shall be subject to the applicable provisions of this code for material and installation.

507 SAFETY DEVICES

507.1 Anti-Siphon Devices

507.1.1 Means acceptable to the plumbing official shall be provided to prevent siphoning of any water heater or tank to which any water heater or tank is connected. A cold water "dip" tube with a hole at the top or a vacuum relief valve installed in the cold water supply line above the top of the heater or tank may be accepted for this purpose.

507.1.2 Bottom fed heaters or bottom fed tanks connected to water heaters shall have a vacuum relief valve installed. The vacuum relief valve shall be in compliance with the appropriate requirements of ANSI Z21.22.

507.2 Water Temperature Control in Piping from Tankless Heaters.

The temperature of water from tankless heaters shall be tempered to 140°F (60°C) when intended for domestic uses. This provision shall not supercede the requirement for protective valves in the shower per 613.1.

507.3 Relief Valve

All storage water heaters operating above atmospheric pressure shall be provided with an approved, self-closing (levered) pressure relief valve and temperature relief valve or combination thereof, except for nonstorage instantaneous heaters. Such valves shall be installed in the shell of the water heater tank or may be installed in the hot water outlet, provided the thermo-bulb extends into the shell of the tank. Temperature relief valves shall be so located in the tank as to be actuated by the water in the top one-eighth of the tank served. For installations with separate storage tanks, said valves shall be installed on the tank and there shall not be any type of valve installed between the water heater and the storage tank. There shall not be a check valve or shutoff valve between a relief valve and the heater or tank which it serves. The relief valve shall not be used as a means of controlling thermal expansion, (see 613.2)

507.4 Energy Cutoff Device

All automatically controlled water heaters shall be equipped with an energy cutoff device which will cut off the supply of heat energy to the water tank before the temperature of the water in the tank exceeds 210°F (99°C). This cutoff device is in addition to the temperature and pressure relief valves.

507.5 Relief Valve Approval

Temperature and pressure relief valves, or combinations thereof, or energy shutoff devices shall bear the label of the AGA or ASME, with a thermostetting of not more than 210°F (99°C) and pressure setting not to exceed the tank or heater manufacturer's rated working pressure. The relieving capacity of these two devices shall each equal or exceed the heat input to the water heater or storage tank.

507.6 Relief Outlet Waste

The outlet of a pressure, temperature, or other relief valve shall not be directly connected to the drainage system.

507.7 Heater Over 200,000 Btuh Input

The relief valve shall have a minimum AGA temperature steam rating of 200,000 Btu (211,000 kJ), shall comply with all construction, testing and installation requirements of ANSI Z21.22, and shall have minimum 1 inch inlet and outlet pipe size connections. In addition, the temperature relieving element of the valve shall have a water discharge capacity based on 1250 Btu (1319 kJ) for each gallon per hour of water discharged at 30 psi (207 kPa) working pressure and a maximum temperature of 210°F (99°C). This rating must be certified by the valve manufacturer. Also, the pressure relieving element of the valve shall be ASME pressure steam rated. Both the temperature water rating and the ASME pressure steam rating of the combination temperature and pressure relief valve shall be equal to or in excess of the input to the hot water storage tank or storage water heater.

507.8 Safety Pans and Relief Valve Waste

507.8.1 When water heaters or hot water storage tanks are installed in remote locations such as suspended ceiling spaces or in attics, the tank or heater shall rest in a galvanized steel or other metal pan of equal corrosive

resistance having a thickness at least equal to 0.0276-inch (0.7 mm) galvanized sheet steel.

Exception: Electric water heaters may rest in a high impact plastic pan of at least 1/16 inch (1.6 mm) thickness.

507.8.2 Safety pans shall be no less than 1 1/2 inches (38mm) deep and shall be of sufficient size and shape to receive all drippings or condensate from the tank or heater. The pan shall be drained by a pipe no less than 1 inch (25.4 mm) diameter.

507.8.3 The pan drain shall extend full-size and terminate over a suitably located indirect waste receptor or floor drain or extend to the exterior of the building and terminate no less than 6 inches (152 mm) or more than 24 inches (610 mm) above grade.

507.8.4 The discharge from the relief valve shall be piped full-size separately to the outside of the building or to an indirect waste receptor so that any discharge can cause no personal injury or property damage and can be readily observed by the building occupants. Relief valve discharge piping shall contain no valves or traps and shall be so graded and connected as to drip to the discharge end of the piping by gravity. When the relief valve discharge is piped to the outside of the building, it shall terminate no less than 6 inches (152 mm) and no more than 24 inches (610 mm) above finish grade.

507.8.5 Relief valve discharge piping shall be of those materials listed in 611 or Table 507, or shall be tested and rated for such use.

Table 507 Relief Valve Materials

Material(s)	Standards
Water Heater Relief Valve Drain Tubes	ASME A 112.4.1